

Air purifier “Reverselt” talk notes

- Product – what it does
- Goal: making it controllable from openHAB
- Taking it apart – first failures
- Slipping a knife into the top section pops it out easily
- Board first findings:
 - One-layer PCB
 - Metal springs and through-hole LEDs to save money, since they had to have only one side SMT-assembled – all front-side components are easily soldered manually
 - Compressed springs are in contact with the capacitive pads on the panel
 - Important – to some extent in this case – labels on the board. SCL and SDA are usually I2C “serial clock” and “serial data”
- First step: taking good pictures
- Second step: take note of the chip numbers
 - Taking a picture with the flash on at an angle usually makes the engravings readable
- Third step: DuckDuckGo – but there’s not a lot to see
 - The chips are not very widespread or heavily documented
 - They’re both MCUs
- Fourth step: take a close look
 - The Elan MCU seems in charge of the fan control and LEDs, the Holtek one seems in charge of the touch pads
 - They talk to each other probably over I2C, with separate sets of signals passing through the R5 and R12 resistors on the front side
 - It looks like the communication to the fan might happen over I2C as well, considering the labels on the front side
- Checking with an ESP32 I2C sniffer shows absolutely nothing
- Wires are soldered on the wires not exposed for easier probing
 - Note: manufacturer usually use lead-free solder for manufacturing to comply with international standards. We don’t need to comply, so it’s easier to first replace it or “dilute” it with leaded solder to lower its melting point
- I find that the controller just sends a voltage on one of the pins to set the fan speed
- Current seems to be ~21mA (47ohm resistors on board with measured voltage drop of 1V across the resistor)

- Testing it with a 100ohm resistor ($\sim 1.2\text{V}$, 0.12mA) also seems to work
- Testing it with no resistor with an ESP32 breakout board (so 3.3V) also works
- Note: Technology Connections fan speed video <https://www.youtube.com/watch?v=hQ3GW7IVBWY>
- Kicad STM32 design video from Phil's Lab: <https://www.youtube.com/watch?v=C7-8nUU6e3E>